

We claim:

1. A ceramic decal assembly comprised of a substrate, a layer of adhesive contiguous with said substrate, and a ceramic decal contiguous with said layer of adhesive, wherein:
 - (a) said substrate is selected from the group consisting of a glass substrate, a ceramic substrate, and a glass-ceramic substrate; and mixtures thereof, and
 - (b) said layer of adhesive has a thickness of less than about 100 microns, and is comprised of at least about 95 weight percent of carbonaceous material; and
 - (c) said ceramic decal is comprised of an imaged transferable covercoat wherein:
 1. said imaged transferable covercoat is comprised of at least about 25 weight percent of carbonaceous thermoplastic material;
 2. said imaged transferable covercoat is comprised of moieties selected from the group consisting of opacification particles, colorant particles, and mixtures thereof, wherein said moieties have a particle size distribution such that at least about 90 weight percent of said moieties are within the range of from about 0.2 to about 30 microns;
 3. said imaged transferable covercoat is comprised of film-forming glass flux;
 4. said moieties have a first concentration in said imaged transferable covercoat and said film-forming glass flux has a second concentration in said imaged transferable covercoat, the ratio of said first concentration to said second concentration is no greater than about 1.25.
2. The ceramic decal assembly as recited in claim 1, wherein said layer of adhesive is comprised of a pressure sensitive adhesive.

3. The ceramic decal assembly as recited in claim 1, wherein said ceramic decal is further comprised of a flexible substrate.
4. The ceramic decal assembly as recited in claim 3, wherein:
 - (a) said flexible substrate has a surface energy of less than about 50 dynes per centimeter;
 - (b) said flexible substrate is removeably connected to said imaged transferable covercoat, said layer of adhesive and said substrate such that upon removal of said flexible substrate, a precursor assembly is formed.
5. The ceramic decal assembly as recited in claim 1, wherein said layer of adhesive has a thickness of less than about 50 microns, and is comprised of an acrylic polymer.
6. The ceramic decal assembly as recited in claim 5, wherein after said ceramic decal assembly has been subjected to a temperature of at least about 500 degrees Celsius for at least about 10 minutes to produce an imaged substrate, wherein said imaged substrate has an optical density that is at least about 80 percent of the optical density of said ceramic decal assembly prior to the time it has been subjected to said temperature of at least about 500 degrees Celsius for at least about 10 minutes.
7. The ceramic decal assembly as recited in claim 6, wherein said imaged transferable covercoat is comprised of at least 50 weight percent of said carbonaceous thermoplastic material.
8. The ceramic decal assembly as recited in claim 7, wherein said imaged transferable covercoat has an elongation to break of at least about 1 percent.
9. The ceramic decal assembly as recited in claim 8, wherein said ceramic decal assembly is comprised of an image and said image is comprised of said film-forming glass flux.

10. The ceramic decal assembly as recited in claim 9, wherein said film-forming glass flux has a melting temperature of greater than about 550 degrees Celsius.
11. The ceramic decal assembly as recited in claim 10, wherein said image is comprised of a frosting image layer.
12. The ceramic decal assembly as recited in claim 11, wherein said frosting image layer is comprised of said moieties.
13. The ceramic decal assembly as recited in claim 12, wherein said moieties have a first refractive index, and said film-forming glass flux has a second refractive index, such that the difference between said first refractive index and said second refractive index is at least 0.1.
14. The ceramic decal assembly as recited in claim 13, wherein said moieties have a first melting point, and said film-forming glass flux has a second melting point, such that said first melting point exceeds said second melting point by at least about 50 degrees Celsius.
15. The ceramic decal assembly as recited in claim 8, wherein said image is comprised of from about 20 to about 40 weight percent of solid, volatilizable carbonaceous binder.
16. The ceramic decal assembly as recited in claim 9, wherein said film-forming glass flux is present in said image at a concentration of from about 35 to about 75 weight percent.
17. The ceramic decal assembly as recited in claim 13, wherein said first refractive index exceeds said second refractive index by at least about 0.2.
18. The ceramic decal assembly as recited in claim 14, wherein said first melting point exceeds said second melting point by at least about 100 degrees Celsius.

19. The decal assembly as recited in claim 1, wherein said moieties are metal oxide colorant particles.
20. The decal assembly as recited in claim 3, wherein said ceramic decal is further comprised of a decal release layer and an image wherein;
 - (a) said decal release layer has a surface energy of less than 50 dynes per centimeter, and
 - (b) said decal release layer is disposed directly upon said flexible substrate, and
 - (c) said imaged transferable covercoat is disposed directly upon said decal release layer, and
 - (d) said image is disposed directly upon said imaged transferable covercoat, and
 - (e) said imaged transferable covercoat is separable from said decal release layer.
21. The ceramic decal assembly as recited in claim 4, wherein after said precursor assembly has been subjected to a temperature of at least about 500 degrees Celsius for at least about 10 minutes to produce an imaged substrate, wherein said imaged substrate has an optical density that is at least about 80 percent of the optical density of said precursor assembly prior to the time it has been subjected to said temperature of at least about 500 degrees Celsius for at least about 10 minutes.
22. A process of forming a decorated ceramic substrate comprising the steps of;
 - (a) adhesively attaching a ceramic decal to a substrate with a pressure sensitive adhesive, wherein said ceramic decal is comprised of a flexible substrate and a carbonaceous material, and
 - (b) removing said flexible substrate to form a precursor assembly, and

(c) thereafter firing said precursor assembly to remove substantially all of said carbonaceous material in said precursor assembly, wherein a fired assembly is formed and an image is fixed on said substrate.

23. The process as recited in claim 22, wherein said substrate is selected from the group consisting of a glass substrate, a ceramic substrate, a glass-ceramic substrate, and mixtures thereof.

24. The process as recited in claim 23, wherein said pressure sensitive adhesive has a thickness of less than about 100 microns, and is comprised of at least about 95% weight percent of carbonaceous material.

25. The process as recited in claim 22, wherein said ceramic decal is further comprised of an imaged transferable covercoat.

26. The process as recited in claim 25, wherein said imaged transferable covercoat is comprised of moieties selected from the group consisting of opacification particles, colorant particles, and mixtures thereof, wherein said moieties have a particle size distribution such that at least 90 weight percent of said moieties are within the range of from about 0.2 to about 30 microns.

27. The process as recited in claim 26, wherein said imaged transferable covercoat is further comprised of film-forming glass flux, wherein said moieties have a first concentration in said imaged transferable covercoat, said film-forming glass flux has a second concentration in said imaged transferable covercoat, and the ratio of said first concentration to said second concentration is no greater than about 1.25.

28. The process as recited in claim 25, wherein said imaged transferable covercoat, said image, said pressure sensitive adhesive and said substrate are subjected to a temperature

of at least about 500 degrees Celsius for at least about 10 minutes to form said decorated ceramic substrate such that the optical density of said decorated ceramic substrate is at least about 80 percent of the optical density of said ceramic decal ~~assembly~~ prior to the time it has been subjected to said temperature of at least about 500 degrees Celsius for at least about 10 minutes.

29. The process as recited in claim 22, wherein said pressure sensitive adhesive is comprised of a first surface and a second surface, and said pressure sensitive adhesive is disposed between a first release liner substrate and a second release liner substrate, and wherein:

- (a) said first release liner substrate is removed from said pressure sensitive adhesive, exposing said first surface, and
- (b) said first surface is first attached to said substrate with pressure, and
- (c) said second release liner substrate is removed from said pressure sensitive adhesive, exposing said second surface, and
- (d) said second surface is then used to attach said ceramic decal to said substrate with pressure.

30. The process as recited in claim 22 wherein said ceramic decal is comprised of a decal release layer and an imaged transferable covercoat wherein:

- (a) said decal release layer is disposed between said flexible substrate and said imaged transferable covercoat,
- (b) said decal release layer has a surface energy of less than 50 dynes per centimeter,
- (c) said image is disposed directly upon said imaged transferable covercoat and

said image and said imaged transferable covercoat is adapted to be separated from said flexible substrate and said decal release layer.

31. The process as recited in claim 22, wherein said image is applied to said imaged transferable covercoat using a printer selected from the following group consisting of a digital printer and an analog printer.
32. The process as recited in claim 31 wherein said printer is a thermal transfer printer.
33. The process as recited in claim 31 wherein said printer is a gravure printer.
34. The ceramic decal assembly of claim 1, wherein said imaged transferable covercoat is a flexible imaged transferable covercoat.
35. The ceramic decal assembly of claim 3, wherein said imaged transferable covercoat is said flexible substrate.